



SEQUENCE LISTING

<110> ID-Lelystad, Instituut voor Dierhouderij en Diergezondheid B.V.
 Willemssen, Petrus T.J.
 Westerveen, Sjoukje F.
 Bakker, Douwe
 Zijderveld van, Fred G.
 Thole, Jelle E.R.

<120> Paramycobacterial diagnostics and vaccines

<130> P54977PC00

<140> PCT/NL03/00020

<141> 2003-01-13

<150> EP 02075089.9

<151> 2002-01-11

<160> 22

<170> PatentIn Ver. 2.1

<210> 1

<211> 1175

<212> DNA

<213> Mycobacterium avium paratuberculosis

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<223> Description of Combined DNA/RNA Molecule:
 immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (134)..(1144)

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agaggagact tcc gtg ccg aac cga cgc cga cgc aag ctt tcg aca gcc 169
 Val Pro Asn Arg Arg Arg Arg Lys Leu Ser Thr Ala
 1 5 10

atg agc gcg gtc gcc gcc ctg gca gtg gcg agt cct tgc gca tac ttc 217
 Met Ser Ala Val Ala Ala Leu Ala Val Ala Ser Pro Cys Ala Tyr Phe
 15 20 25

ctt gtc tac gaa tcg acg gcc ggc aac aag gcg ccc gag cac cac gag 265
 Leu Val Tyr Glu Ser Thr Ala Gly Asn Lys Ala Pro Glu His His Glu
 30 35 40

ttc aag cag gcc gca gtg atg agc gat ctg ccg ggc gag ctg atg ggt 313
 Phe Lys Gln Ala Ala Val Met Ser Asp Leu Pro Gly Glu Leu Met Gly
 45 50 55 60

gcg ctg tcg cag ggc ctg tcg cag ttt ggc atc aac ctg ccc ccg gtg 361
 Ala Leu Ser Gln Gly Leu Ser Gln Phe Gly Ile Asn Leu Pro Pro Val
 65 70 75

ccc gcc ctg agc ggc ggc gcc acc agc act ccc ggt ctg gcc agc ccc 409
 Pro Ala Leu Ser Gly Gly Ala Thr Ser Thr Pro Gly Leu Ala Ser Pro
 80 85 90

ggc Gly	ctg Leu	ggt Gly 95	agc Ser	ccc Pro	ggc Gly	ctg Leu	ggc Gly 100	acg Thr	ccc Pro	ggc Gly	ctg Leu	gga Gly 105	acg Thr	ccg Pro	ggc Gly	457
ctg Leu	acc Thr 110	aat Asn	ccc Pro	ggt Gly	ctg Leu	acg Thr 115	agc Ser	ccc Pro	ggt Gly	gcg Ala	acc Thr 120	agt Ser	ccc Pro	ggc Gly	ctg Leu	505
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ctg Leu	ccg Pro	acc Thr	acg Thr 160	ccg Pro	ggc Gly	ggc Gly	ggg Gly	gtc Val 165	gcc Ala	acc Thr	ccc Pro	ggc Gly	gcc Ala 170	ggg Gly	ctc Leu	649
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ccg Pro	ggg Gly 190	ctg Leu	ggc Gly	agc Ser	ccg Pro	acc Thr 195	gtg Val	gcg Ala	ccg Pro	agt Ser	gag Glu 200	gtg Val	ccg Pro	atc Ile	gac Asp	745
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acc Thr	ggt Gly	ctg Leu	ggc Gly 240	ggc Gly	ggc Gly	tcg Ser	agc Ser	tcg Ser 245	ggt Gly	ggc Gly	agc Ser	ggc Gly	ggc Gly 250	ctg Leu	gtc Val	889
aac Asn	gac Asp	gtg Val 255	atg Met	caa Gln	gcc Ala	gcc Ala	aac Asn 260	cag Gln	ctc Leu	ggc Gly	gcg Ala	ggt Gly 265	cag Gln	gcg Ala	atc Ile	937
gac Asp	ctg Leu 270	ctc Leu	aag Lys	ggc Gly	ctg Leu	gtg Val 275	atg Met	ccg Pro	gcg Ala	atc Ile	acg Thr 280	cag Gln	ggc Gly	atg Met	cac His	985
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ggc Gly	gcg Ala	gcc Ala	ggc Gly	gcc Ala 305	ctg Leu	ccc Pro	ggt Gly	gcg Ala	gcc Ala 310	ggc Gly	gcc Ala	ctg Leu	ccg Pro	ggt Gly 315	gcg Ala	1081
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<210> 2
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 <212> PRT
 <213> Mycobacterium avium paratuberculosis

<220>
 <223> Description of Combined DNA/RNA Molecule:
 immunogenic protein of M. avium paratuberculosis

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 20 25 30
 Ser Thr Ala Gly Asn Lys Ala Pro Glu His His Glu Phe Lys Gln Ala
 35 40 45
 Ala Val Met Ser Asp Leu Pro Gly Glu Leu Met Gly Ala Leu Ser Gln
 50 55 60
 Gly Leu Ser Gln Phe Gly Ile Asn Leu Pro Pro Val Pro Ala Leu Ser
 65 70 75 80
 Gly Gly Ala Thr Ser Thr Pro Gly Leu Ala Ser Pro Gly Leu Gly Ser
 85 90 95
 Pro Gly Leu Gly Thr Pro Gly Leu Gly Thr Pro Gly Leu Thr Asn Pro
 100 105 110
 Gly Leu Thr Ser Pro Gly Ala Thr Ser Pro Gly Leu Thr Ser Pro Gly
 115 120 125
 Leu Thr Ser Pro Gly Leu Thr Ser Pro Gly Leu Thr Ser Pro Gly Ala
 130 135 140
 Ala Pro Thr Thr Pro Gly Leu Thr Ala Pro Gly Ala Leu Pro Thr Thr
 145 150 155 160
 Pro Gly Gly Gly Val Ala Thr Pro Gly Ala Gly Leu Asn Pro Ala Leu
 165 170 175
 Ser Asn Pro Gly Leu Thr Ser Pro Ala Gly Thr Ala Pro Gly Leu Gly
 180 185 190
 Ser Pro Thr Val Ala Pro Ser Glu Val Pro Ile Asp Ser Gly Ala Gly
 195 200 205
 Leu Asp Pro Gly Ala Gly Gly Thr Tyr Pro Ile Leu Gly Asp Pro Ser
 210 215 220
 Thr Phe Gly Asn Ala Ser Pro Ile Gly Gly Gly Thr Gly Leu Gly
 225 230 235 240
 Gly Gly Ser Ser Ser Gly Gly Ser Gly Gly Leu Val Asn Asp Val Met
 245 250 255
 Gln Ala Ala Asn Gln Leu Gly Ala Gly Gln Ala Ile Asp Leu Leu Lys
 260 265 270
 Gly Leu Val Met Pro Ala Ile Thr Gln Gly Met His Gly Gly Ala Ala
 275 280 285
 Ala Gly Ala Leu Pro Gly Ala Ala Gly Ala Leu Pro Gly Ala Ala Gly
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 Gly Ala Leu Pro Ala Ala Gly Ala Ala Pro Ala Leu Pro Pro Val
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<210> 3
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 <213> Mycobacterium avium paratuberculosis

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 <223> Description of Combined DNA/RNA Molecule:

immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (67)..(567)

<400> 3

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      Met Ser Arg Leu Ser Phe Val Cys Arg Leu Leu Ala Ala Thr
      1          5          10
gct ttc gcc gtc gcc ctg cta ctc ggg ctg ggc gac gtg ccg cgc gcg 156
Ala Phe Ala Val Ala Leu Leu Leu Gly Leu Gly Asp Val Pro Arg Ala
15          20          25          30
gcg gcc acc gac gac cgc ctg caa ttc acc gcg acc acg ctc agc ggc 204
Ala Ala Thr Asp Asp Arg Leu Gln Phe Thr Ala Thr Thr Leu Ser Gly
          35          40          45
gcg ccg ttc aac ggc gcc agt ctg cag ggc aag ccc gcc gtg ctg tgg 252
Ala Pro Phe Asn Gly Ala Ser Leu Gln Gly Lys Pro Ala Val Leu Trp
          50          55          60
ttc tgg acg ccg tgg tgc ccg tac tgc aac gcc gag gcc ccg ggc gtg 300
Phe Trp Thr Pro Trp Cys Pro Tyr Cys Asn Ala Glu Ala Pro Gly Val
          65          70          75
agc cgg gtg gcc gcc gcc aac ccg ggc gtc acc ttc gtc ggc gtc gcc 348
Ser Arg Val Ala Ala Ala Asn Pro Gly Val Thr Phe Val Gly Val Ala
          80          85          90
gcc cac tcc gaa gtc ggc gcc atg gcc aac ttc gtc tcc aag tac aac 396
Ala His Ser Glu Val Gly Ala Met Ala Asn Phe Val Ser Lys Tyr Asn
          95          100          105          110
ctg aac ttc acc acg ctc aac gac gcc gac ggc gcg atc tgg gcc cgc 444
Leu Asn Phe Thr Thr Leu Asn Asp Ala Asp Gly Ala Ile Trp Ala Arg
          115          120          125
tac ggc gtg ccc tgg cag ccc gcg tac gtg ttc tac cgg gcg gac ggc 492
Tyr Gly Val Pro Trp Gln Pro Ala Tyr Val Phe Tyr Arg Ala Asp Gly
          130          135          140
agc tcc acc ttc gtc aac aac ccc acc tcg gcg atg ccc cag gac gaa 540
Ser Ser Thr Phe Val Asn Asn Pro Thr Ser Ala Met Pro Gln Asp Glu
          145          150          155
ctg gcc gcc cgg gtg gcg gcg ctg cgc tgacgtggac cgcggtctgg 587
Leu Ala Ala Arg Val Ala Ala Leu Arg
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<210> 4

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<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

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35 40 45
Phe Asn Gly Ala Ser Leu Gln Gly Lys Pro Ala Val Leu Trp Phe Trp
50 55 60
Thr Pro Trp Cys Pro Tyr Cys Asn Ala Glu Ala Pro Gly Val Ser Arg
65 70 75 80
Val Ala Ala Ala Asn Pro Gly Val Thr Phe Val Gly Val Ala Ala His
85 90 95
Ser Glu Val Gly Ala Met Ala Asn Phe Val Ser Lys Tyr Asn Leu Asn
100 105 110
Phe Thr Thr Leu Asn Asp Ala Asp Gly Ala Ile Trp Ala Arg Tyr Gly
115 120 125
Val Pro Trp Gln Pro Ala Tyr Val Phe Tyr Arg Ala Asp Gly Ser Ser
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145 150 155 160
Ala Arg Val Ala Ala Leu Arg
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<210> 5
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<212> DNA
<213> Mycobacterium avium paratuberculosis

<220>
<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>
<221> CDS
<222> (34)..(366)

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Leu Gly Val Ala Val Gly Ser Ala Ala Val Ala Leu Thr Ala Ala Ala
10 15 20
ggg gtc gca tcc gcc gac ccc atg gac gcg atc atc aac acc acc tgc 150
Gly Val Ala Ser Ala Asp Pro Met Asp Ala Ile Ile Asn Thr Thr Cys
25 30 35
aac tac ggg cag gtg atc gcc gcg ctg aac gcg tcc gac ccg gcg gct 198
5

Asn Tyr Gly Gln Val Ile Ala Ala Leu Asn Ala Ser Asp Pro Ala Ala
 40 45 50 55
 gcc cag cag ctg aac tcg tcg ccg atg gcg cag tcc tac atc cag cgg 246
 Ala Gln Gln Leu Asn Ser Ser Pro Met Ala Gln Ser Tyr Ile Gln Arg
 60 65 70
 ttc ctg gcc tcc ccg ccg gcg aag cgt cag cag atg gcc cag cag atc 294
 Phe Leu Ala Ser Pro Pro Ala Lys Arg Gln Gln Met Ala Gln Gln Ile
 75 80 85
 cag ggc atg ccg gcc gcg cag cag tac atc aac gac atc aac cag gtc 342
 Gln Gly Met Pro Ala Ala Gln Gln Tyr Ile Asn Asp Ile Asn Gln Val
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 Ala Val Thr Cys Asn Asn Phe
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<210> 6
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 <212> PRT
 <213> Mycobacterium avium paratuberculosis

<220>
 <223> Description of Combined DNA/RNA Molecule:
 immunogenic protein of M. avium paratuberculosis

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 35 40 45
 Asn Ala Ser Asp Pro Ala Ala Ala Gln Gln Leu Asn Ser Ser Pro Met
 50 55 60
 Ala Gln Ser Tyr Ile Gln Arg Phe Leu Ala Ser Pro Pro Ala Lys Arg
 65 70 75 80
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<210> 7
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 <213> Mycobacterium avium paratuberculosis

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 <223> Description of Combined DNA/RNA Molecule:
 immunogenic protein of M. avium paratuberculosis

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 <222> (46)..(1410)

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tac Tyr	cgg Arg	ccc Pro	ggt Gly 40	gac Asp	ccg Pro	ccg Pro	ctg Leu	gcc Ala 45	ggg Gly	tcg Ser	ctg Leu	ctg Leu	atc Ile 50	ggc Gly	ggc Gly	201
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gac Asp 70	ctg Leu	gtc Val	ggc Gly	aac Asn	aac Asn	ctg Leu 75	ggc Gly	ggg Gly	cgc Arg	tgg Trp	gcc Ala 80	gac Asp	cgg Arg	ttc Phe	ggc Gly	297
ggg Gly 85	ctg Leu	gtc Val	ttc Phe	gac Asp	gcc Ala 90	acc Thr	ggg Gly	atc Ile	acc Thr 95	acc Thr	ccg Pro	gag Glu	ggc Gly	ctg Leu	aag Lys 100	345
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gcc Ala	cgc Arg	gtg Val 120	gtg Val	gtg Val	gtc Val	ggc Gly	acc Thr	acg Thr 125	ccc Pro	gac Asp	gcc Ala	gcc Ala	gcc Ala 130	ggc Gly	ccg Pro	441
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ggc Gly 150	aag Lys	gag Glu	ctg Leu	cgc Arg	aac Asn	ggc Gly 155	tcg Ser	acg Thr	gtg Val	gcg Ala	ctg Leu 160	gtg Val	tac Tyr	ctg Leu	tcg Ser	537
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gtg Val 245	gaa Glu	tcg Ser	gcc Ala	gcc Ala	gag Glu 250	acg Thr	ctg Leu	gcc Ala	gag Glu	acg Thr 255	gcc Ala	agc Ser	cgg Arg	gtc Val	ggc Gly 260	825

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atc acc gag cac ctg cgc gag cac cac ggc ggt cac gcc gac atc ctg	921
Ile Thr Glu His 280 Leu Arg Glu His 285 His Gly Gly His Ala 290 Asp Ile Leu	
gtc aac aac gcc ggg atc acc cgc gac aag ctg ctg gcc aac atg gac	969
Val Asn Asn 295 Ala Gly Ile Thr 300 Arg Asp Lys Leu Leu 305 Ala Asn Met Asp	
gac gcg cgc tgg gac gcc gtg ttg gcc gtg aat ctg ctt gcc cca ctt	1017
Asp Ala Arg Trp Asp Ala Val 315 Leu Ala Val Asn 320 Leu Leu Ala Pro Leu	
cgc ctt acc gaa ggg ctg gtg ggc aac ggc agc atc ggc gaa ggc ggc	1065
Arg Leu Thr Glu Gly 330 Val Gly Asn Gly 335 Ser Ile Gly Glu Gly 340 Gly	
cgc atc gtc ggc ctt tcg tcg atg gcc ggc atc gcg ggc aac cgc ggc	1113
Arg Ile Val Gly Leu 345 Ser Ser Met Ala 350 Gly Ile Ala Gly Asn 355 Arg Gly	
cag acc aac tac gcc acc acc aag gca ggc atg atc ggc ctc acc cag	1161
Gln Thr Asn Tyr Ala Thr Thr Lys Ala 365 Gly Met Ile Gly Leu Thr Gln	
gcg ctg gcg ccg gag ctc tac gac aag ggc atc acc atc aac gcc gtc	1209
Ala Leu Ala 375 Pro Glu Leu Tyr Asp 380 Lys Gly Ile Thr 385 Ile Asn Ala Val	
gcg ccg gga ttc atc gag acc cag atg acg gcc gcc atc ccg ctg gcc	1257
Ala Pro Gly Phe Ile Glu Thr 395 Gln Met Thr Ala 400 Ala Ile Pro Leu Ala	
acc cgc gag gtg ggg cgc cgg atg aac tcg ctg ctg cag ggc ggc cag	1305
Thr Arg Glu Val Gly Arg Arg Met Asn Ser Leu Leu Gln Gly Gly Gln 420	
ccg gtg gac gtc gcc gaa acc atc gcc tac ttc gcc agc ccg gcg tcg	1353
Pro Val Asp Val Ala 425 Glu Thr Ile Ala Tyr 430 Phe Ala Ser Pro Ala Ser	
aac gcg gtg acc ggc aac gtc atc cgg gtc tgc ggc cag gcg atg ctg	1401
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Gly Ala	

<210> 8

<211> 454

<212> PRT

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<400> 8

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 Thr Leu Arg₃₅ Arg Tyr Arg Pro Gly₄₀ Asp Pro Pro Leu Ala₄₅ Gly Ser Leu
 Leu Ile Gly Gly Glu Gly Arg₅₅ Val Val Glu Pro Leu Arg Ala Ala Leu
 Ala Lys Asp Tyr Asp Leu₇₀ Val Gly Asn Asn Leu₇₅ Gly Gly Arg Trp Ala₈₀
 Asp Arg Phe Gly Gly₈₅ Leu Val Phe Asp Ala Thr Gly Ile Thr Thr Pro
 Glu Gly Leu Lys₁₀₀ Gly Leu Tyr Glu Phe₁₀₅ Phe Thr Pro Leu Leu Arg Asn
 Leu Gly His₁₁₅ Cys Ala Arg Val Val₁₂₀ Val Val Gly Thr Thr Pro Asp Ala
 Ala Ala Gly Pro His Glu Arg₁₃₅ Ile Ala Gln Arg Ala Leu Glu Gly Phe
 Thr Arg Ser Leu Gly Lys₁₅₀ Glu Leu Arg Asn Gly Ser Thr Val Ala Leu
 Val Tyr Leu Ser Pro₁₆₅ Ala Ala Lys Pro Ala₁₇₀ Ala Thr Gly Leu Glu Ser
 Thr Met Arg Phe₁₈₀ Ile Leu Ser Ala Lys₁₈₅ Ser Ala Tyr Val Asp Gly Gln
 Val Phe Tyr₁₉₅ Val Gly Glu Ala Asp Ser Thr Pro Pro Ala Asp Trp Glu
 Arg Pro Leu Asp Gly Lys Val₂₁₅ Ala Ile Val Thr Gly Ala Ala Arg Gly
 Ile Gly Ala Thr Ile Ala₂₃₀ Glu Val Phe Ala Arg Asp Gly Ala Arg Val
 Val Ala Ile Asp Val₂₄₅ Glu Ser Ala Ala Glu Thr Leu Ala Glu Thr Ala
 Ser Arg Val Gly Gly Thr Ala Leu Trp₂₆₅ Leu Asp Val Thr Ala Pro Asp
 Ala Val Asp Lys Ile Thr Glu His₂₈₀ Leu Arg Glu His His₂₈₅ Gly Gly His
 Ala Asp Ile Leu Val Asn Asn₂₉₅ Ala Gly Ile Thr Arg Asp Lys Leu Leu
 Ala Asn Met Asp Asp Ala₃₁₀ Arg Trp Asp Ala Val Leu Ala Val Asn Leu
 Leu Ala Pro Leu Arg₃₂₅ Leu Thr Glu Gly Leu Val Gly Asn Gly Ser Ile
 Gly Glu Gly Gly Arg Ile Val Gly Leu Ser Ser Met Ala Gly Ile Ala
 Gly Asn Arg Gly Gln Thr Asn Tyr₃₆₀ Ala Thr Thr Lys Ala Gly Met Ile
 Gly Leu Thr Gln Ala Leu Ala₃₇₅ Pro Glu Leu Tyr Asp Lys Gly Ile Thr
 Ile Asn Ala Val Ala Pro Gly Phe Ile Glu Thr Gln Met Thr Ala Ala
 Ile Pro Leu Ala Thr Arg₃₉₀ Glu Val Gly Arg Arg Met Asn Ser Leu Leu
 Gln Gly Gly Gln Pro Val Asp Val Ala₄₂₅ Glu Thr Ile Ala Tyr Phe Ala
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 <212> DNA

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (179)..(625)

<223> /note="Xaa at location 95 stands for Gln or His,
at location 118 stands for Gly or Arg, at location
147 stands for stop codon, Trp or Cys"

<400> 9

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gcaagtcgac gttcggcgcg aatcgggtgag gtgggcacag gtgaatgacg aagaggac 178
atg ctg gtc gcc acg gtg cgg gcg ttc atc gac cgc gag gtc aaa ccg 226
Met Leu Val Ala Thr Val Arg Ala Phe Ile Asp Arg Glu Val Lys Pro
 1          5          10          15
acc gtg cgc gag gtg gag cac gcc gat gcc tat ccc gag gcg tgg atc 274
Thr Val Arg Glu Val Glu His Ala Asp Ala Tyr Pro Glu Ala Trp Ile
          20          25          30
gag cag atg aag cgg atc ggg atc tac ggg ctg gcg gtg ccc gag gaa 322
Glu Gln Met Lys Arg Ile Gly Ile Tyr Gly Leu Ala Val Pro Glu Glu
          35          40          45
tac ggt ggt tcg ccg gtg tcc atg ccg tgc tac gtg cgg gtc acc gag 370
Tyr Gly Gly Ser Pro Val Ser Met Pro Cys Tyr Val Arg Val Thr Glu
          50          55          60
cag ctg gcg cgc ggc tgg atg agc ctg gcc ggg gcg atg ggc ggg cac 418
Gln Leu Ala Arg Gly Trp Met Ser Leu Ala Gly Ala Met Gly Gly His
          65          70          75          80
acc gtg gtg gcc aag ctg cta acg ctg ttc ggc acc gag gac cas aag 466
Thr Val Val Ala Lys Leu Leu Thr Leu Phe Gly Thr Glu Asp Xaa Lys
          85          90          95
cgg gcc tac ctg ccg cgg atg gcc agc ggc gaa atc cgg gcc acc atg 514
Arg Ala Tyr Leu Pro Arg Met Ala Ser Gly Glu Ile Arg Ala Thr Met
          100          105          110
gcg ttg acc gag ccc sgc ggc ggc tcg gac ctg cag aac atg tcg acc 562
Ala Leu Thr Glu Pro Xaa Gly Gly Ser Asp Leu Gln Asn Met Ser Thr
          115          120          125
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Lys Thr Xaa Ile Asn 625
145
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<210> 10

<211> 149

<212> PRT

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (95)..(147)

<223> /note="Xaa at location 95 stands for Gln or His,
at location 118 stands for Gly or Arg, at location
147 stands for stop codon, Trp or Cys"

<400> 10

Met Leu Val Ala Thr Val Arg Ala Phe Ile Asp Arg Glu Val Lys Pro
1 5 10 15

Thr Val Arg Glu Val Glu His Ala Asp Ala Tyr Pro Glu Ala Trp Ile
20 25 30

Glu Gln Met Lys Arg Ile Gly Ile Tyr Gly Leu Ala Val Pro Glu Glu
35 40 45

Tyr Gly Gly Ser Pro Val Ser Met Pro Cys Tyr Val Arg Val Thr Glu
50 55 60

Gln Leu Ala Arg Gly Trp Met Ser Leu Ala Gly Ala Met Gly Gly His
65 70 75 80

Thr Val Val Ala Lys Leu Leu Thr Leu Phe Gly Thr Glu Asp Xaa Lys
85 90 95

Arg Ala Tyr Leu Pro Arg Met Ala Ser Gly Glu Ile Arg Ala Thr Met
100 105 110

Ala Leu Thr Glu Pro Xaa Gly Gly Ser Asp Leu Gln Asn Met Ser Thr
115 120 125

Thr Ala Leu Pro Asp Pro Asp Ser Asp Xaa Leu Val Val Asn Gly Ala
130 135 140

Lys Thr Xaa Ile Asn
145

<210> 11

<211> 241

<212> DNA

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (147)..(239)

<400> 11

gtgggggcaa gcccaattacg ttgcgcatcga cccggcacag gcggtcgctc acgtcatcaa 60

catgccgctc atccccgatg aggtctcgaat gaccttgcta cgcaggcgct gaacgcacga 120

cgaaacggac cggaggtgaa agggac atg agc cac gcc gat caa ctc gct cgg 173
Met Ser His Ala Asp Gln Leu Ala Arg
1 5

acg cac ctg gcg ccc gat cct gcg gac ctg tcg cgc ctg gtc gcc ggc 221
Thr His Leu Ala Pro Asp Pro Ala Asp Leu Ser Arg Leu Val Ala Gly
10 15 20 25

acc cac cac gac ccg cac gg 241
Thr His His Asp Pro His
30

<210> 12

<211> 31

<212> PRT

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<400> 12

Met Ser His Ala Asp Gln Leu Ala Arg Thr His Leu Ala Pro Asp Pro
1 5 10 15
Ala Asp Leu Ser Arg Leu Val Ala Gly Thr His His Asp Pro His
20 25 30

<210> 13

<211> 236

<212> DNA

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (8)..(214)

<400> 13

ggacacc aac gtg acc ggg gtg ttt ctc acc gcc cag gcg gcg gcc cgg 49
Asn Val Thr Gly Val Phe Leu Thr Ala Gln Ala Ala Ala Arg
1 5 10

gcg atg atg cgg cag ggc cgc ggc ggc gcc atc atc acc acc gcc tcg 97
Ala Met Met Arg Gln Gly Arg Gly Gly Ala Ile Ile Thr Thr Ala Ser
15 20 25 30

atg tcc ggg cac atc atc aac gtc ccg cag cag gtc ggc cac tac tgc 145
Met Ser Gly His Ile Ile Asn Val Pro Gln Gln Val Gly His Tyr Cys
35 40 45

gcc agc aag gcg gcc gtg atc cag ctg acc aag gcc atg gcc gtc gaa 193
Ala Ser Lys Ala Ala Val Ile Gln Leu Thr Lys Ala Met Ala Val Glu
50 55 60

ttc tgc agg atc cgt cga ctc tagactcgag caagcttatg ca 236
Phe Cys Arg Ile Arg Arg Leu
65

<210> 14
 <211> 69
 <212> PRT
 <213> Mycobacterium avium paratuberculosis

<220>
 <223> Description of Combined DNA/RNA Molecule:
 immunogenic protein of M. avium paratuberculosis

<400> 14
 Asn Val Thr Gly Val Phe Leu Thr Ala Gln Ala Ala Ala Arg Ala Met
 1 5 10 15
 Met Arg Gln Gly Arg Gly Gly Ala Ile Ile Thr Thr Ala Ser Met Ser
 20 25 30
 Gly His Ile Ile Asn Val Pro Gln Gln Val Gly His Tyr Cys Ala Ser
 35 40 45
 Lys Ala Ala Val Ile Gln Leu Thr Lys Ala Met Ala Val Glu Phe Cys
 50 55 60
 Arg Ile Arg Arg Leu
 65

<210> 15
 <211> 419
 <212> DNA
 <213> Mycobacterium avium paratuberculosis

<220>
 <223> Description of Combined DNA/RNA Molecule:
 immunogenic protein of M. avium paratuberculosis

<220>
 <221> CDS
 <222> (25)..(417)
 <223> /note="Xaa at location 103 stands for Met, Val or
 Leu, Xaa at location 125 stands for Lys, Arg, Thr
 or Met"

<400> 15
 cggccaccgc acccagggga ggcc atg act cac acc aag gcc ggt cgt gcc 51
 Met Thr His Thr Lys Ala Gly Arg Ala
 1 5
 gcg tgg ccg gcc gcc tgc gcg gtc gtc ctg tcc gcc gcc gcg ctg ttg 99
 Ala Trp Pro Ala Ala Cys Ala Val Val Leu Ser Ala Ala Ala Leu Leu
 10 15 20 25
 tgc gcg gca gcg gcc gcc gcg gac gaa gcc gat gac gcg ttc ctc gcc 147
 Cys Ala Ala Ala Ala Ala Ala Asp Glu Ala Asp Asp Ala Phe Leu Ala
 30 35 40
 ggc ctg gcc aag ggc ggg atc acc atg ttc gac gac gac gac gcg atc 195
 Gly Leu Ala Lys Gly Gly Ile Thr Met Phe Asp Asp Asp Asp Ala Ile
 45 50 55
 gcc atg ggc cac agc gtg tgc tcg agc atc gac gcc aac ccc aac gtg 243
 Ala Met Gly His Ser Val Cys Ser Ser Ile Asp Ala Asn Pro Asn Val
 13

60	65	70	
tcg atg ctg gcg ctg cgg ctg acc aag caa acc ccg ttg acg ccg aag			291
Ser Met Leu Ala Leu Arg Leu Thr Lys Gln Thr Pro Leu Thr Pro Lys			
75	80	85	
caa tcc ggc tac ttc atc ggt ctt tcg gtc gcc agc tac ntg ccc gca			339
Gln Ser Gly Tyr Phe Ile Gly Leu Ser Val Ala Ser Tyr Xaa Pro Ala			
90	95	100	105
gta caa gga cga cgt cga ccc ctc gct ggg ctg gct gat ccc gcc gcc			387
Val Gln Gly Arg Arg Pro Leu Ala Gly Leu Ala Asp Pro Ala Ala			
	110	115	120
gct gat gtg ang ttg ccg gcc ggc atc ggc gt			419
Ala Asp Val Xaa Leu Pro Ala Gly Ile Gly			
	125	130	

<210> 16

<211> 131

<212> PRT

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (103)..(125)

<223> /note="Xaa at location 103 stands for Met, Val or
Leu, Xaa at location 125 stands for Lys, Arg, Thr
or Met"

<400> 16

Met Thr His Thr Lys Ala Gly Arg Ala Ala Trp Pro Ala Ala Cys Ala

1

5

10

15

Val Val Leu Ser Ala Ala Ala Leu Leu Cys Ala Ala Ala Ala Ala Ala

20

25

30

Asp Glu Ala Asp Asp Ala Phe Leu Ala Gly Leu Ala Lys Gly Gly Ile

35

40

45

Thr Met Phe Asp Asp Asp Asp Ala Ile Ala Met Gly His Ser Val Cys

50

55

60

Ser Ser Ile Asp Ala Asn Pro Asn Val Ser Met Leu Ala Leu Arg Leu

65

70

75

80

Thr Lys Gln Thr Pro Leu Thr Pro Lys Gln Ser Gly Tyr Phe Ile Gly

85

90

95

Leu Ser Val Ala Ser Tyr Xaa Pro Ala Val Gln Gly Arg Arg Arg Pro

100

105

110

Leu Ala Gly Leu Ala Asp Pro Ala Ala Ala Asp Val Xaa Leu Pro Ala

115

120

125

Gly Ile Gly

130

gac Asp 110	atc Ile	acc Thr	gac Asp	gcg Ala	gtc Val 115	atc Ile	acc Thr	gta Val	ccg Pro	gcg Ala 120	tac Tyr	ttc Phe	aac Asn	gac Asp	gcc Ala 125	387
cag Gln	cgt Arg	cag Gln	gcg Ala	acc Thr 130	aag Lys	gaa Glu	gcc Ala	ggc Gly	cag Gln 135	atc Ile	gcc Ala	ggc Gly	ctc Leu	aac Asn 140	gtg Val	435
ctg Leu	cgc Arg	atc Ile	gtc Val 145	aac Asn	gag Glu	ccg Pro	acc Thr	gcg Ala 150	gcc Ala	gcg Ala	ctg Leu	gcc Ala	tac Tyr 155	ggc Gly	ctg Leu	483
gac Asp	aag Lys	ggc Gly 160	gag Glu	aag Lys	gag Glu	cag Gln	acc Thr 165	atc Ile	ctg Leu	gtc Val	ttc Phe	gac Asp 170	ctc Leu	ggc Gly	ggc Gly	531
ggc Gly	acg Thr 175	ttc Phe	gac Asp	gtt Val	tcg Ser	ctg Leu 180	ctc Leu	gag Glu	atc Ile	ggc Gly 185	gag Glu	ggt Gly	gtg Val	gtc Val	gag Glu	579
gtc Val 190	cgc Arg	gcc Ala	acc Thr	agc Ser	ggt Gly 195	gac Asp	aac Asn	caa Gln	ctc Leu	ggt Gly 200	ggc Gly	gac Asp	gac Asp	tgg Trp	gac Asp 205	627
gac Asp	cgg Arg	atc Ile	gtc Val	aac Asn 210	tgg Trp	ctg Leu	gtc Val	gac Asp	aag Lys 215	ttc Phe	aag Lys	ggc Gly	acc Thr 220	agc Ser	ggc Gly	675
atc Ile	gac Asp	ctg Leu	acc Thr 225	aag Lys	gac Asp	aag Lys	atg Met	gcc Ala 230	atg Met	cag Gln	cgg Arg	ctg Leu	cgt Arg 235	gag Glu	gcc Ala	723
gcc Ala	gag Glu	aag Lys 240	gcc Ala	aag Lys	atc Ile	gag Glu	ttg Leu 245	tcc Ser	agc Ser	tcg Ser	cag Gln	agc Ser 250	acc Thr	tcg Ser	atc Ile	771
aac Asn 255	ctg Leu	ccc Pro	tac Tyr	atc Ile	acc Thr	gtc Val 260	gac Asp	gcg Ala	gac Asp	aag Lys	aac Asn 265	ccg Pro	ctg Leu	ttc Phe	ctc Leu	819
gac Asp 270	gag Glu	cag Gln	ctg Leu	acc Thr	cgc Arg 275	gcc Ala	gaa Glu	ttc Phe	cag Gln	cgc Arg 280	atc Ile	acc Thr	cag Gln	gat Asp	ctg Leu 285	867
ctg Leu	gac Asp	cgc Arg	acc Thr	cgt Arg 290	cag Gln	ccg Pro	ttc Phe	aag Lys	tcg Ser 295	gtg Val	atc Ile	gcc Ala	gac Asp	gcc Ala 300	ggc Gly	915
atc Ile	tcg Ser	gtg Val	tcc Ser 305	gac Asp	atc Ile	gac Asp	cac His	gtg Val 310	gtg Val	ctg Leu	gtg Val	ggt Gly 315	ggt Gly	tcc Ser	acc Thr	963
cgg Arg	atg Met	ccc Pro 320	gcg Ala	gtg Val	acc Thr	gac Asp	ctg Leu 325	gtc Val	aag Lys	gaa Glu	ctc Leu	acc Thr 330	ggc Gly	ggc Gly	aag Lys	1011
gag Glu 335	ccc Pro	aac Asn	aag Lys	ggc Gly	gtc Val	aac Asn 340	ccc Pro	gac Asp	gag Glu	gtt Val	gtc Val 345	gcg Ala	gtg Val	ggt Gly	gcc Ala	1059
gcc Ala 350	ctg Leu	cag Gln	gcc Ala	ggt Gly	gtg Val 355	ctt Leu	aag Lys	ggc Gly	gag Glu	gtg Val 360	aaa Lys	gac Asp	gtt Val	ctg Leu	ctg Leu 365	1107

ctt	gac	gtt	acg	ccg	ctg	agc	ctg	ggt	atc	gag	acc	aag	ggt	ggc	gtg	1155
Leu	Asp	Val	Thr	Pro	Leu	Ser	Leu	Gly	Ile	Glu	Thr	Lys	Gly	Gly	Val	
				370					375					380		
atg	acc	aag	ctg	atc	gaa	cgc	aac	acc	acc	atc	ccg	acc	aag	cgg	tcc	1203
Met	Thr	Lys	Leu	Ile	Glu	Arg	Asn	Thr	Thr	Ile	Pro	Thr	Lys	Arg	Ser	
			385					390					395			
gag	acg	ttc	acc	acg	gcc	gac	gac	aac	cag	ccg	tcg	gtg	cag	atc	cag	1251
Glu	Thr	Phe	Thr	Thr	Ala	Asp	Asp	Asn	Gln	Pro	Ser	Val	Gln	Ile	Gln	
		400					405					410				
gtg	tat	cag	ggt	gag	cgc	gaa	atc	gcc	gcg	cac	aac	aag	ctg	ctc	ggc	1299
Val	Tyr	Gln	Gly	Glu	Arg	Glu	Ile	Ala	Ala	His	Asn	Lys	Leu	Leu	Gly	
	415					420					425					
tcc	ttc	gag	ctg	acc	gga	att	ccg	ccg	gcg	ccc	cgc	ggc	gtg	ccg	cag	1347
Ser	Phe	Glu	Leu	Thr	Gly	Ile	Pro	Pro	Ala	Pro	Arg	Gly	Val	Pro	Gln	
					435					440					445	
atc	gag	gtc	acc	ttc	gac	atc	gac	gcc	aac	ggc	atc	gtg	cac	gtc	acc	1395
Ile	Glu	Val	Thr	Phe	Asp	Ile	Asp	Ala	Asn	Gly	Ile	Val	His	Val	Thr	
				450					455					460		
gcc	aag	gac	aag	ggc	acc	ggt	aag	gag	aac	acg	atc	aag	atc	cag	gag	1443
Ala	Lys	Asp	Lys	Gly	Thr	Gly	Lys	Glu	Asn	Thr	Ile	Lys	Ile	Gln	Glu	
			465					470					475			
ggc	tcc	ggc	ctg	tcc	aag	gag	gag	atc	gac	cgg	atg	atc	aag	gac	gcc	1491
Gly	Ser	Gly	Leu	Ser	Lys	Glu	Glu	Ile	Asp	Arg	Met	Ile	Lys	Asp	Ala	
		480				485						490				
gag	gcg	cac	gcc	gag	gag	gac	cgc	aag	agg	cgc	gag	gaa	gcc	gac	gtc	1539
Glu	Ala	His	Ala	Glu	Glu	Asp	Arg	Lys	Arg	Arg	Glu	Glu	Ala	Asp	Val	
	495					500					505					
cgc	aac	caa	gcg	gaa	tcg	ctt	gtc	tac	cag	acg	gag	aag	ttc	gtc	aag	1587
Arg	Asn	Gln	Ala	Glu	Ser	Leu	Val	Tyr	Gln	Thr	Glu	Lys	Phe	Val	Lys	
	510				515					520					525	
gac	cag	cgc	gag	gcc	gag	ggc	ggc	tcg	aag	gtt	ccc	gag	gag	acg	ctg	1635
Asp	Gln	Arg	Glu	Ala	Glu	Gly	Gly	Ser	Lys	Val	Pro	Glu	Glu	Thr	Leu	
				530					535					540		
tcc	aag	gtc	gac	gcc	gcg	atc	gcc	gac	gcc	aag	acg	gcc	ctg	ggc	ggc	1683
Ser	Lys	Val	Asp	Ala	Ala	Ile	Ala	Asp	Ala	Lys	Thr	Ala	Leu	Gly	Gly	
			545					550					555			
acc	gac	atc	acc	gcg	atc	aag	tcg	gcg	atg	gag	aag	ctc	ggc	cag	gag	1731
Thr	Asp	Ile	Thr	Ala	Ile	Lys	Ser	Ala	Met	Glu	Lys	Leu	Gly	Gln	Glu	
		560					565					570				
tcg	caa	gcg	ctg	gga	cag	gca	atc	tac	gag	gcc	acc	cag	gcc	gag	tcc	1779
Ser	Gln	Ala	Leu	Gly	Gln	Ala	Ile	Tyr	Glu	Ala	Thr	Gln	Ala	Glu	Ser	
	575					580					585					
gcc	cag	gct	ggc	ggg	ccg	gac	ggt	gcc	gcg	gcc	ggc	ggc	ggg	tcc	gga	1827
Ala	Gln	Ala	Gly	Gly	Pro	Asp	Gly	Ala	Ala	Ala	Gly	Gly	Gly	Ser	Gly	
	590				595					600					605	
tcc	gcc	gac	gat	gtt	gtg	gac	gcg	gag	gtg	gtc	gac	gat	gac	cgg	gag	1875
Ser	Ala	Asp	Asp	Val	Val	Asp	Ala	Glu	Val	Val	Asp	Asp	Asp	Arg	Glu	
				610					615					620		

tcc aag tga
Ser Lys

1884

<210> 20
<211> 623
<212> PRT
<213> Mycobacterium avium paratuberculosis

<220>
<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<400> 20
Met Ala Arg Ala Val Gly Ile Asp Leu Gly Thr Thr Asn Ser Val Val
1 5 10 15
Ala Val Leu Glu Gly Gly Asp Pro Val Val Ala Asn Ser Glu Gly
20 25 30
Ser Arg Thr Thr Pro Ser Ile Val Ala Phe Ala Arg Asn Gly Glu Val
35 40 45
Leu Val Gly Gln Pro Ala Lys Asn Gln Ala Val Thr Asn Val Asp Arg
50 55 60
Thr Ile Arg Ser Val Lys Arg His Met Gly Thr Asp Trp Ser Ile Glu
65 70 75 80
Ile Asp Gly Lys Lys Tyr Thr Ala Gln Glu Ile Ser Ala Arg Val Leu
85 90 95
Met Lys Leu Lys Arg Asp Ala Glu Ala Tyr Leu Gly Glu Asp Ile Thr
100 105 110
Asp Ala Val Ile Thr Val Pro Ala Tyr Phe Asn Asp Ala Gln Arg Gln
115 120 125
Ala Thr Lys Glu Ala Gly Gln Ile Ala Gly Leu Asn Val Leu Arg Ile
130 135 140
Val Asn Glu Pro Thr Ala Ala Ala Leu Ala Tyr Gly Leu Asp Lys Gly
145 150 155 160
Glu Lys Glu Gln Thr Ile Leu Val Phe Asp Leu Gly Gly Gly Thr Phe
165 170 175
Asp Val Ser Leu Leu Glu Ile Gly Glu Gly Val Val Glu Val Arg Ala
180 185 190
Thr Ser Gly Asp Asn Gln Leu Gly Gly Asp Asp Trp Asp Asp Arg Ile
195 200 205
Val Asn Trp Leu Val Asp Lys Phe Lys Gly Thr Ser Gly Ile Asp Leu
210 215 220
Thr Lys Asp Lys Met Ala Met Gln Arg Leu Arg Glu Ala Ala Glu Lys
225 230 235 240
Ala Lys Ile Glu Leu Ser Ser Ser Gln Ser Thr Ser Ile Asn Leu Pro
245 250 255
Tyr Ile Thr Val Asp Ala Asp Lys Asn Pro Leu Phe Leu Asp Glu Gln
260 265 270
Leu Thr Arg Ala Glu Phe Gln Arg Ile Thr Gln Asp Leu Leu Asp Arg
275 280 285
Thr Arg Gln Pro Phe Lys Ser Val Ile Ala Asp Ala Gly Ile Ser Val
290 295 300
Ser Asp Ile Asp His Val Val Leu Val Gly Gly Ser Thr Arg Met Pro
305 310 315 320
Ala Val Thr Asp Leu Val Lys Glu Leu Thr Gly Gly Lys Glu Pro Asn
325 330 335
Lys Gly Val Asn Pro Asp Glu Val Val Ala Val Gly Ala Ala Leu Gln
340 345 350
Ala Gly Val Leu Lys Gly Glu Val Lys Asp Val Leu Leu Leu Asp Val
355 360 365
Thr Pro Leu Ser Leu Gly Ile Glu Thr Lys Gly Gly Val Met Thr Lys
370 375 380
Leu Ile Glu Arg Asn Thr Thr Ile Pro Thr Lys Arg Ser Glu Thr Phe
19

385 Thr Thr Ala Asp Asp Asn Gln Pro Ser Val Gln Ile Gln Val Tyr Gln
 405 410 415
 Gly Glu Arg Glu Ile Ala Ala His Asn Lys Leu Leu Gly Ser Phe Glu
 420 425 430
 Leu Thr Gly Ile Pro Pro Ala Pro Arg Gly Val Pro Gln Ile Glu Val
 435 440 445
 Thr Phe Asp Ile Asp Ala Asn Gly Ile Val His Val Thr Ala Lys Asp
 450 455 460
 Lys Gly Thr Gly Lys Glu Asn Thr Ile Lys Ile Gln Glu Gly Ser Gly
 465 470 475 480
 Leu Ser Lys Glu Glu Ile Asp Arg Met Ile Lys Asp Ala Glu Ala His
 485 490 495
 Ala Glu Glu Asp Arg Lys Arg Arg Glu Glu Ala Asp Val Arg Asn Gln
 500 505 510
 Ala Glu Ser Leu Val Tyr Gln Thr Glu Lys Phe Val Lys Asp Gln Arg
 515 520 525
 Glu Ala Glu Gly Gly Ser Lys Val Pro Glu Glu Thr Leu Ser Lys Val
 530 535 540
 Asp Ala Ala Ile Ala Asp Ala Lys Thr Ala Leu Gly Gly Thr Asp Ile
 545 550 555 560
 Thr Ala Ile Lys Ser Ala Met Glu Lys Leu Gly Gln Glu Ser Gln Ala
 565 570 575
 Leu Gly Gln Ala Ile Tyr Glu Ala Thr Gln Ala Glu Ser Ala Gln Ala
 580 585 590
 Gly Gly Pro Asp Gly Ala Ala Ala Gly Gly Gly Ser Gly Ser Ala Asp
 595 600 605
 Asp Val Val Asp Ala Glu Val Val Asp Asp Asp Arg Glu Ser Lys
 610 615 620

<210> 21

<211> 1701

<212> DNA

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of M. avium paratuberculosis

<220>

<221> CDS

<222> (76)..(1701)

<400> 21

gcagcctggt cgtccgtcgc gggcactgca cccggccagg acgtgtcatc cccaatccgg 60

aggaatcact tcgca atg gcc aag aca att gcg tac gac gaa gag gcc cgt 111
Met Ala Lys Thr Ile Ala Tyr Asp Glu Glu Ala Arg
1 5 10

cgc ggc ctc gag cgg ggg ctc aac gcc ctc gcc gac gcg gta aag gtc 159
Arg Gly Leu Glu Arg Gly Leu Asn Ala Leu Ala Asp Ala Val Lys Val
15 20 25

acg ttg ggc ccc aag ggt cgc aac gtc gtc ctg gag aag aag tgg ggt 207
Thr Leu Gly Pro Lys Gly Arg Asn Val Val Leu Glu Lys Lys Trp Gly
30 35 40

gcc ccc acg atc acc aac gat ggt gtg tcc atc gcc aag gag atc gag 255
Ala Pro Thr Ile Thr Asn Asp Gly Val Ser Ile Ala Lys Glu Ile Glu
45 50 55 60

ctg gag gac ccg tac gag aag atc ggc gcc gag ctg gtc aag gaa gtc	303
Leu Glu Asp Pro Tyr 65 Glu Lys Ile Gly Ala 70 Glu Leu Val Lys Glu Val 75	
gcc aag aag acc gac gac gtc gcc ggt gac ggc acg acg acg gcc acg	351
Ala Lys Lys Thr 80 Asp Asp Val Ala 85 Gly Asp Gly Thr Thr 90 Thr Ala Thr	
gtg ctc gcc cag gcg ttg gtc cgc gag ggc ctg cgc aac gtc gcg gcc	399
Val Leu Ala 95 Gln Ala Leu Val Arg 100 Glu Gly Leu Arg Asn 105 Val Ala Ala	
ggc gcc aac ccg ctg ggt ctc aag cgc ggc atc gag aag gcc gtc gag	447
Gly Ala Asn Pro Leu Gly Leu Lys Arg Gly Ile Glu Lys Ala Val Glu	
110 115 120	
aag gtc acc gag acc ctg ctc aag tcg gcc aag gag gtc gag acc aag	495
Lys Val Thr Glu Thr Leu Lys Ser Ala Lys 135 Glu Val Glu Thr Lys 140	
gac cag atc gct gcc acc gcg gcc atc tcc gcg ggc gac cag tcg atc	543
Asp Gln Ile Ala Thr Ala Ala Ile Ser 150 Ala Gly Asp Gln Ser 155 Ile	
ggc gac ctg atc gcc gag gcg atg gac aag gtc ggc aac gag ggc gtc	591
Gly Asp Leu Ile Ala Glu Ala Met Asp Lys Val Gly Asn Glu Gly Val	
160 165 170	
atc acc gtc gag gag tcc aac acc ttc ggc ctg cag ctc gag ctc acc	639
Ile Thr Val Glu Glu Ser Asn Thr 180 Phe Gly Leu Gln Leu Glu Leu Thr	
175 185	
gag ggt atg cgg ttc gac aag ggt tac atc tcg ggc tac ttc gtc acg	687
Glu Gly Met Arg Phe Asp Lys Gly Tyr Ile Ser Gly Tyr Phe Val Thr	
190 195 200	
gac gcc gag cgt cag gaa gcg gtc ctc gag gac ccg ttc atc ctg ctg	735
Asp Ala Glu Arg Gln Glu Ala Val Leu Glu Asp 215 Pro Phe Ile Leu Leu 220	
205 210 215 220	
gtc agc tcc aag gtc tcg acc gtc aag gac ctg ctg ccg ctg ctg gag	783
Val Ser Ser Lys Val Ser Thr Val Lys Asp Leu Leu Pro Leu Leu Glu	
225 230 235	
aag gtc atc cag gcc ggc aag ccg ctg ctg atc atc gcc gag gac gtc	831
Lys Val Ile Gln Ala Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Val	
240 245 250	
gag ggc gag gcc ctg tcc acc ctg gtc gtc aac aag atc cgc ggc acc	879
Glu Gly Glu Ala Leu Ser Thr Leu Val Val Asn Lys Ile Arg Gly Thr	
255 260 265	
ttc aag tcg gtg gcc gtc aag gcg ccc ggc ttc ggc gac cgc cgc aag	927
Phe Lys Ser Val Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys	
270 275 280	
gcg atg ctt cag gac atg gcc atc ctc acc ggc ggc cag gtc atc agc	975
Ala Met Leu Gln Asp Met Ala Ile Leu Thr Gly Gly Gln Val Ile Ser 300	
285 290 295 300	
gaa gag gtc ggc ctg tcg ctg gag agc gcc gac atc tcg ctg ctc ggt	1023
Glu Glu Val Gly Leu Ser Leu Glu Ser Ala Asp Ile Ser Leu Leu Gly	
305 310 315	

aag gcc cgc aag gtc gtc gtc acc aag gac gag acc acc atc gtc gag	1071
Lys Ala Arg Lys Val Val Val Thr Lys Asp Glu Thr Thr Ile Val Glu	
320 325 330	
ggc gcc ggt gac tcc gac gcc atc gcc ggc cgg gtg gcc cag atc cgc	1119
Gly Ala Gly Asp Ser Asp Ala Ile Ala Gly Arg Val Ala Gln Ile Arg	
335 340 345	
acc gag atc gag aac agc gac tcc gac tac gac cgc gag aag ctg cag	1167
Thr Glu Ile Glu Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln	
350 355 360	
gag cgg ctg gcc aag ctg gcc ggc ggc gtg gcg gtg atc aag gcc ggc	1215
Glu Arg Leu Ala Lys Leu Ala Gly Gly Val Ala Val Ile Lys Ala Gly	
365 370 375 380	
gcc gcg acc gag gtc gag ctc aag gag cgc aag cac cgc atc gag gac	1263
Ala Ala Thr Glu Val Glu Leu Lys Glu Lys His Arg Ile Glu Asp	
385 390 395	
gcg gtc cgc aac gcc aag gcg gcc gtg gag gag ggc atc gtc gcc ggc	1311
Ala Val Arg Asn Ala Lys Ala Val Glu Glu Gly Ile Val Ala Gly	
400 405 410	
ggt ggc gtg gcc ctg ctg cac gcg atc ccg gct ctg gac gag ctg aag	1359
Gly Gly Val Ala Leu Leu His Ala Ile Pro Ala Leu Asp Glu Leu Lys	
415 420 425	
ctc gag ggc gaa gag gcg acc ggc gcc aac atc gtc cgg gtg gcc ctc	1407
Leu Glu Gly Glu Glu Ala Thr Gly Ala Asn Ile Val Arg Val Ala Leu	
430 435 440	
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Glu Ala Pro Leu Lys Gln Ile Ala Phe Asn Gly Gly Leu Glu Pro Gly	
445 450 455 460	
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Val Val Ala Glu Lys Val Arg Asn Ser Pro Ala Gly Thr Gly Leu Asn	
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gcc gcc acc ggt gag tac gag gac ctg ctc aag gcc ggc att gcc gac	1551
Ala Ala Thr Gly Glu Tyr Glu Asp Leu Leu Lys Ala Gly Ile Ala Asp	
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Pro Val Lys Val Thr Arg Ser Ala Leu Gln Asn Ala Ala Ser Ile Ala	
495 500 505	
ggg ctg ttc ctg acc acc gag gcg gtc gtc gcc gac aag ccg gag aag	1647
Gly Leu Phe Leu Thr Thr Glu Ala Val Val Ala Asp Lys Pro Glu Lys	
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gcg gcc gct ccc gcg ggc gac ccg acc ggc ggc atg ggc ggc atg gac	1695
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Phe	

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<212> PRT

<213> Mycobacterium avium paratuberculosis

<220>

<223> Description of Combined DNA/RNA Molecule:
immunogenic protein of *M. avium* paratuberculosis

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35 40 45
Thr Asn Asp Gly Val Ser Ile Ala Lys Glu Ile Glu Leu Glu Asp Pro
50 55 60
Tyr Glu Lys Ile Gly Ala Glu Leu Val Lys Glu Val Ala Lys Lys Thr
65 70 75 80
Asp Asp Val Ala Gly Asp Gly Thr Thr Thr Ala Thr Val Leu Ala Gln
85 90 95
Ala Leu Val Arg Glu Gly Leu Arg Asn Val Ala Ala Gly Ala Asn Pro
100 105 110
Leu Gly Leu Lys Arg Gly Ile Glu Lys Ala Val Glu Lys Val Thr Glu
115 120 125
Thr Leu Leu Lys Ser Ala Lys Glu Val Glu Thr Lys Asp Gln Ile Ala
130 135 140
Ala Thr Ala Ala Ile Ser Ala Gly Asp Gln Ser Ile Gly Asp Leu Ile
145 150 155 160
Ala Glu Ala Met Asp Lys Val Gly Asn Glu Gly Val Ile Thr Val Glu
165 170 175
Glu Ser Asn Thr Phe Gly Leu Gln Leu Glu Leu Thr Glu Gly Met Arg
180 185 190
Phe Asp Lys Gly Tyr Ile Ser Gly Tyr Phe Val Thr Asp Ala Glu Arg
195 200 205
Gln Glu Ala Val Leu Glu Asp Pro Phe Ile Leu Leu Val Ser Ser Lys
210 215 220
Val Ser Thr Val Lys Asp Leu Leu Pro Leu Glu Lys Val Ile Gln
225 230 235 240
Ala Gly Lys Pro Leu Leu Ile Ile Ala Glu Asp Val Glu Gly Glu Ala
245 250 255
Leu Ser Thr Leu Val Val Asn Lys Ile Arg Gly Thr Phe Lys Ser Val
260 265 270
Ala Val Lys Ala Pro Gly Phe Gly Asp Arg Arg Lys Ala Met Leu Gln
275 280 285
Asp Met Ala Ile Leu Thr Gly Gly Gln Val Ile Ser Glu Glu Val Gly
290 295 300
Leu Ser Leu Glu Ser Ala Asp Ile Ser Leu Leu Gly Lys Ala Arg Lys
305 310 315 320
Val Val Val Thr Lys Asp Glu Thr Thr Ile Val Glu Gly Ala Gly Asp
325 330 335
Ser Asp Ala Ile Ala Gly Arg Val Ala Gln Ile Arg Thr Glu Ile Glu
340 345 350
Asn Ser Asp Ser Asp Tyr Asp Arg Glu Lys Leu Gln Glu Arg Leu Ala
355 360 365
Lys Leu Ala Gly Gly Val Ala Val Ile Lys Ala Gly Ala Ala Thr Glu
370 375 380
Val Glu Leu Lys Glu Arg Lys His Arg Ile Glu Asp Ala Val Arg Asn
385 390 395 400
Ala Lys Ala Ala Val Glu Glu Gly Ile Val Ala Gly Gly Gly Val Ala
405 410 415
Leu Leu His Ala Ile Pro Ala Leu Asp Glu Leu Lys Leu Glu Gly Glu
420 425 430
Glu Ala Thr Gly Ala Asn Ile Val Arg Val Ala Leu Glu Ala Pro Leu
435 440 445
Lys Gln Ile Ala Phe Asn Gly Gly Leu Glu Pro Gly Val Val Ala Glu
450 455 460

Lys 465	Val	Arg	Asn	Ser	Pro 470	Ala	Gly	Thr	Gly	Leu 475	Asn	Ala	Ala	Thr	Gly 480
Glu	Tyr	Glu	Asp	Leu 485	Leu	Lys	Ala	Gly	Ile 490	Ala	Asp	Pro	Val	Lys 495	Val
Thr	Arg	Ser	Ala 500	Leu	Gln	Asn	Ala	Ala 505	Ser	Ile	Ala	Gly	Leu 510	Phe	Leu
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Ala	Gly 530	Asp	Pro	Thr	Gly	Gly 535	Met	Gly	Gly	Met	Asp 540	Phe			